

of harmonic progressions. It is remarkable that there is a special analogy between Greek ornament and Greek music. Melody was perfectly developed among the Greeks, while they seem to have entered very slightly into the capabilities of harmony. Their ornament is also, as far as series or independent successions are concerned, perfect; but it exhibits few combinations beyond this. Ornament became more complicated among the Romans; but it was not until comparatively modern times, as in music, that those vast schemes were developed which constitute the masterpieces of their respective arts; such as are displayed by the Moors in Sicily or in Spain, or by the great masters of Italy. The Parthenon itself, taken as a whole, is a magnificent combined harmony, but examined as to its ornamental details, is of an extremely simple character: the sculptures of the pediments are the only departure from a simple progressive series of uniform materials. In his next lecture, Mr. Wornum proposed to treat of harmonies in colour.

#### THE INDISCRIMINATE PRAISE OF THE BUILDING IN HYDE PARK.

I HAVE waited patiently up to this time in the expectation that the tremendous flourish of drums and trumpets about the Exhibition building in the Park would cease, and something like a calm and reasonable investigation of the merits of the work would supervene. The noise being now somewhat hushed, I think I may venture to write this letter, to suggest a few points of inquiry as to the con-

struction and appointments of the building, and to state a fact or two which I think should be known. I may premise, that I should not have gone into the matter had all the leudations we have heard been comparative, and made with reference to shortness of time, &c.; but they are absolute, and the building is referred to as an illustration of the highest pitch to which the science of construction has been carried in this country. Without presuming to dictate, and certainly without any desire to undervalue the importance of the undertaking, I may perhaps be permitted, under the circumstances, to ask a few questions and make a few suggestions.

Dismissing for the present all inquiry as to how this design came to be adopted by the commission, I will confine myself to the building as it stands. We are told by the authorised exponent of the work, that every portion of the building is the result of most minute and scientific calculation (he was, by the way, guilty of a piece of gratuitous impertinence about architects never calculating, &c. &c.). Now, the first point to which this calculation would apply, would be, I apprehend, to determine the size and section of the columns, so as to obtain the requisite strength with the least metal. Has this been done? Or is the form adopted the result of any *a priori* calculation whatever? I very much doubt if these queries can be answered in the affirmative: and (without pretending to be guided by an elaborate equation) I would suggest, to moot a point, whether the form A in the accompanying sketch be not stronger

sented to the introduction of wrought-iron diagonal tie-rods in some parts of the work; now, the principle of construction being one of inertia, or dead weight, and not of equilibrium, I, for one, do not think these ties will be of much use, although I cannot agree with Mr. Scott Russell, who, in a harangue he delivered at the Institution of Civil Engineers, made it out that any one in a series of columns might be broken without disturbing any other part of the work, and illustrated his position by stating you might knock away I don't know how many legs of a dining-room table, and it would stand all the same. Without offence to Mr. Russell, he has, by proving too much, talked nonsense, inasmuch as if one of the columns, say on the ground story, were to be broken away, the girders which that column supported would certainly follow it, as would also all the superincumbent columns and load, and if that load were a heavy one, the leverage and cross strain would, most probably, break the adjoining columns, and make a tolerable "average" of the whole affair. However, dismissing the above amateur engineering, I wish to make a remark on the manner in which the tie-rods are fitted. They are brought up at the intersections through a cast-iron ring, apparently about five-eighths or three-quarters of an inch thick, tapped at the ends, and screwed up with nuts. Wherein consists the strength of these ties? It is measured by the power of the worm of the screw, and by the power of the cast-iron ring to resist extension: even a wrought-iron ring would become distorted: why not have used coupling plates and wedged up? I suspect this is a bit of a quirk on the part of the contractors: they seem to say, "You shall have your ties if you like, but we will take care they shall be of no use."

I now come to a very great gun that has been so often fired off with so much noise,—I mean the ridge and furrow roofs, and the so-called "Paxton gutters." You will be rather surprised to hear that Mr. Paxton is no more the original inventor of these arrangements than your printer's devil. To prove this it will be sufficient to state that the late Mr. W. Strutt, of Derby, in conjunction with the late Mr. C. Sylvester, engineer, executed on a small scale a ridge and furrow roof, with the triple gutter, forty years ago, but the triple gutter was of iron: this Mr. Paxton admits he has seen, and it does so happen that Mr. John Sylvester, the son of Charles Sylvester, designed and executed, seven years ago, a vineery for the Right Hon. E. Strutt (the son of Mr. W. Strutt), wherein the triple gutter out of the solid in wood and the ridge and furrow roof are adopted, the columns being used as downright rain-water pipes. Indeed, to come nearer home, if any of your readers will go four or five miles on the Edgware-road, they will see on the left hand side a ridge and furrow roof over a greenhouse which has been up these twenty-five or thirty years. Had there not been so much noise made about this matter, I should not have alluded to it, as I really considered a knowledge of these arrangements was "common stock" among professional men, and the worst symptom in the business is, that it is not so.

There are many other points in the construction and details of the building worthy of investigation, such as the thickness of the glass, which will certainly be smashed all to pieces if such a hail-storm occur as happened in the neighbourhood of the building three or four years ago. As to the calico covering, perhaps a sailor can tell us how long this would last in a gale of wind. The difference of expansion between the bottoms of the ground-floor columns rigidly tied together underground, and the tops of the columns in the great heat immediately under the glass, is a matter for inquiry: so as to the open floor through which all the dirt from thousands of feet is to be swept into a chamber below, which is to be a source of ventilation. Query, whether the air will be any sweeter for passing through the exhalation of this dunghill; but my letter is already much longer than I intended, so I will conclude by stating that I sat down to write the foregoing

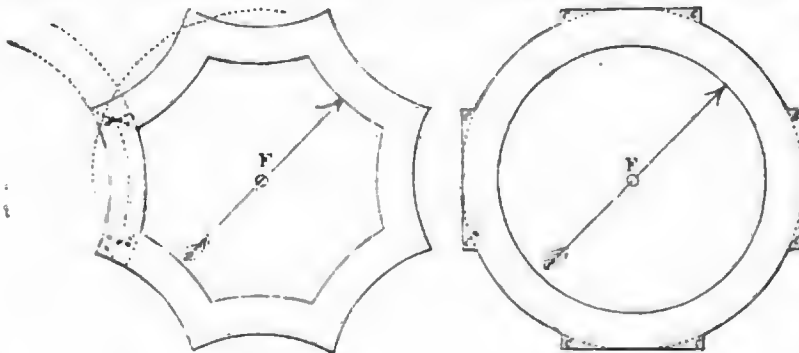


FIG. A.

FIG. B.

than the form B, the one used, and whether it do not also contain less metal: the metal in the form A—the radius of the flutes being equal to that of the circle of the same diameter as the octagon—is the same as in the continuous circle of that diameter; whereas, in the form B, the gusset pieces c c c, &c. are in excess. Suppose a force acting on each column in the direction of the line F, in the case of A the pressure is resisted by a convex surface, in B by a concave surface: in one case the pressure is on the arch, in the other it is applied to the soffit. I am told by an iron-founder that he would as soon cast one column as the other: at all events, the form I suggest is in accordance with nature's construction, as may be observed in the ribbed and fluted forms of the stems of ferns, grasses, &c. Further, with respect to the columns, as a question of art and design, why should they not be ornamental? the cost would be simply the extra expense on one model; and why should not the caps and bases form part of the construction, instead of being "dummies," stuck on afterwards to disguise the construction, and to make it appear one thing whilst it really is another?

To pass to the next important feature of the construction—the girders between the columns,—are these girders or ties (cast-iron, of a trellis pattern) of a proper material for the purpose? and if so, are they of the best form in which the material can be used? I am inclined to think that both these queries must be answered in the negative. Cast-iron, as too many failures have proved, is a most treacherous material, especially when under tension, even in its best form; and I can by no means persuade myself that the

form used is the best: the great characteristic of cast-iron is the power to resist compression; but it is here made to do duty, with respect to the parts on which the strength depends, by the top and bottom flanges, under the most severe tension—a mode of construction very proper for wrought-iron or wood, but surely wasteful and unscientific in cast-iron. I say wasteful, because if the girders will bear a certain proof in this form, they would, I imagine, bear a heavier one if the same weight of metal were arranged in almost any other, say the ordinary open web with top and bottom flange. But why should wrought-iron girders not have been used, unless it be urged that they would take a longer time to make, and would cost more money, which I doubt? Besides, such a plea would be no answer on the merits: the wrought-iron might have been used either in the form of boiler-plate girders, or in the trellis form: half the depth would have given more strength, at least. I know of wrought-iron trellis girders 80 feet span in the clear, which are loaded with two arches in brickwork, the floor above, and the moving weight of hundreds of people, the room being a grand ball and reception room of a palace, of which the girders are 3 feet 6 inches high: those of the exhibition building are 3 feet 4½ inches. Further, as a matter of art and design, would not the effect have been much more harmonious if the slender iron columns had been connected by the light and graceful forms of the wrought-iron trellis, instead of being, apparently, crushed by these ponderous bearers?

It appears that doubts have been entertained of the general stability of the building, and Messrs. Fox and Henderson, I presume for the sake of peace and quietness, have con-